(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
29 December 2005 (29.12.2005)

PCT

(10) International Publication Number
WO 2005/124526 A2

(51) International Patent Classification[7]: G06F 3/033

(21) International Application Number:
PCT/IB2005/052005

(22) International Filing Date: 17 June 2005 (17.06.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/580,655 17 June 2004 (17.06.2004) US

(71) Applicant *(for all designated States except US)*: **KONINKLIJKE PHILIPS ELECTRONICS N.V.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

(71) Applicant *(for AE only)*: **U.S. PHILIPS CORPORATION** [US/US]; 1251 Avenue of the Americas, New York, NY 10020 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **HOLLEMANS, Gerrit G.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL). **KLEINHOUT, Huib V.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL). **HOONHOUT, Heneriette C. M.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL). **WIJDEVEN, Sander B.F. van de** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL). **BUIL, Vincentius P.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

(74) Common Representative: **KONINKLIJKE PHILIPS ELECTRONICS, N.V.**; c/o Edward W. Goodman, P.O. Box 3001, Briarcliff Manor, NY 10510-8001 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

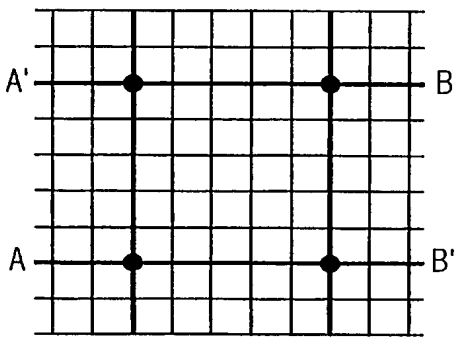
Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations*

[Continued on next page]

(54) Title: USE OF A TWO FINGER INPUT ON TOUCH SCREENS



(57) Abstract: A system and method for detecting at least two-finger input on a touch screen of a display such as computer, etc. includes a display screen; a sensing grid arranged for sensing touch on said display screen; a plurality of electrodes connected electrically to the sensing grid. A controller receives an output from the sensing grid, and a module identifies at least two points on the grid indicating locations of the display screen that have been touched by a user and identifies a geographic portion of the display screen to be identified based on said at least two points. As the position of the fingers are relative to the position of the screen via change in a direction of a Z -coordinate, a variable zoom can be provided by the sensing grid commensurate with different distances that the multiple fingers are sensed from the display screen.

WO 2005/124526 A2

\SDOCID: <WO____2005124526A2_I_>

Published:
— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

NSDOCID: <WO_____2005124526A2_I_>

USE OF A TWO FINGER INPUT ON TOUCH SCREENS

The present invention relates to touch screen displays used in computer terminals, kiosks, PDAs, etc. More particularly, the present invention relates to multiple finger input on touch screens.

Touch screens have had enormous growth in many areas of modern life. Touch screens are now common in places such as kiosks at airports, automatic teller machines (ATMs), vending machines, computers of all kinds. The elimination of the need for a pointing device and/or a light pen in many applications has been widely successful.

There are several different touch technologies, many of which differ in the way that touch is detected. For example, capacitive technologies that utilize the finger as a shunt for a small alternat ing current that is run to ground through the operator's body. With scanning infrared systems, a user's touch is registered when a finger (or a stylus) encounters an array of infrared beams. There is also a surface acoustic-wave touch screen, wherein the screen absorbs the acoustic waves propagating on the touch surface, and the touch is identified by the drop in acoustic signal from the touch location. Resistive touch technologies are based on two layers of conductive material held apart by small, barely visible spacers. When the screen is touched, the two layers come into contact, and two-dimensional coordinate information is generated by the voltages produced at the touch location.

One of the problems with typical touch mechanisms is that they cannot determine the exact position of the fingers pressed up against a screen if more than one finger is used. One reason that such detection mechanisms have a problem with multi-finger pointing is that a sensing grid is used instead of a large number of point sensors.

Fig. 1 illustrates a sensing grid. This figures shows of series of grids having a predetermined shape. Thus, if two fingers touch the screen at the same time, it cannot be determined whether the grid A', A, B', B is caused by the fingers touching A and B, or A' and B.

There is a problem in what occurs when two fingers touch different vertical lines (points A and B are on different vertical lines and different horizontal lines) so that both two vertical lines and

SDOCID: <WO_____2005124526A2_I_>

two horizontal lines are activated (i.e. each point having both a different Y and a different Y coordinate). Thus, there is still a need in the art to identify two finger input using a sensing grid.

The presently claimed invention provides a method and apparatus for a touch mecha nism to detect a two-finger input on touch screens. Although in the typical sensing grid system, it is difficult to determine the placement of the fingers on the grid, in a first aspect of the invention a square formed by the activation of the lines on the sensing grid caused by two finger touch can be used to make a selection of items that are displayed within this square in order to select, zoom, copy, move, delete, etc., or select a dial to rotate the contents of the grid. In the present invention, a combinatorial matrix touch screen is used to indicate a square with two fingers.

In another aspect of the invention, a 3D virtual touch screen, using the two-finger input of the present invention, permits a Z-coordinate that can be used to rotate the selected item(s) around the Z-axis. In addition, the Z-coordinate can be used to as a "zoom" by changing the size of the selection as a function of the distance to the screen.

Fig. 1 is an illustration of a grid array used by a touch screen detection mechanism.

Fig. 2A illustrates a first aspect of the present invention showing a single line of a sensing grid being activated.

Fig. 2B illustrates a second aspect of the present invention utilizing a center of the squares to form a more accurate area sensed by touch.

Fig. 3 illustrates a third aspect of the present invention that can be used with three dimensional viewing systems.

It is to be understood by persons of ordinary skill in the art that the following descriptions are provided for purposes of illustration and not for limitation. An artisan understands that there are many variations that lie within the spirit of the invention and the scope of the appended claims. Unnecessary detail of known functions and operations may be omitted from the current descript ion so as not to obscure the finer points of the present invention.

According to an aspect of the present invention, the square shown in Fig. 1 that is formed by A, B, A' and B' can be used by the system without identifying exactly which two of the four points

NSDOCID: <WO_____2005124526A2_I_>

are being touched by the user. In other words, rather than discriminate between points A and B or A' and B' (or A' and B or A and B'), the bounded rectangle A' B B'A is taken as an input which is then used for the functions such as selection, zoom, color change, highlight, delete, etc. The movement of the fingers along the screen may change the selected portion of the screen. However, for example, once an item is selected, moving the fingers across the screen can perform a drag function for which one normally uses a pointing device, such as a mouse.

In addition, the distance that the fingers are located from the screen can then be used, for example, to select an item, change the degree of zoom, change the colors within the area of the bounded box, or even to highlight the items within the bounded box.

According to another aspect of the present invention, if the same line is touched on multiple locations, this multi-finger touch is detected by comparing which lines are touched in the horizontal direction. Fig. 2A illustrates a single line touched at two points, activating a single line of the sensing grid AB. This particular case would be less likely to occur than the first example, and has particular value, for example, if the difference between the lines activated in a certain direction is too small, e.g. given the granularity of the displayed items that could be selected.

In the particular case shown in Fig. 2A, the vertical line is assumed to be activated by two finger touch; one of the fingers touching point A 205 and another finger touching point B 215. While there is a measurable vertical distance (in the Y direction) between point A 215 and point B 205, the horizontal distance is essentially zero between the two points. If only the AB sense line 210 is active, according to the invention a square can highlighted on screen using a line orthogonal to AB and passing through its midpoint. It should be noted that the exact same concept holds true for horizontally activated sense lines where more than one finger is touching along a same horizontal line activating one horizontal line and two vertical lines, or possibly other angles such as diagonal, as these terms are relative to the position of the user viewing the touch screen.

In other words, if one measures the distance between AB 210, half of that distance is the center, or midpoint of the line. Another line, the exact length of the distance of AB 210, but

NSDOCID: <WO_____2005124526A2_I_>

perpendicular to the line AB 210, is activated through the midpoint, to form a horizontal line A'B' 230, as shown in Fig. 2b. Thus, assuming, for example that one of the finger is touching the point 205 and the other finger is touching the point 221, a single square/rectangle on the sensing grid can be illuminated on the display screen that is comprised of the two finger input.

Therefore, unlike the first aspect of the invention, wherein the bounded box results from two points, both having different X and Y coordinates, in this example, a size of the rectangle shown on the display is calculated by the sensing of a length of at least one sensed line, and at a midpoint of the at least one sensed line calculating a second line 221 that is perpendicular to the at least one sensed line and having a same length as said at least one sensed line 210. Accordingly, based on a length defined by a location of said at least two points 205, 220 of the display screen touched by at least two fingers, and a width defined by two end points 225, 230 of the second line 220, coordinates are provided to show a rectangle being identified on the display screen.

Fig. 3 illustrates yet another aspect of the invention, wherein a screen comprises a 3D virtual touch screen. Typically, in this aspect of the invention, the screen would preferably comprise a capacitance sensing screen. However, it is within the spirit and scope of the invention that there can be an application in other types of touch screens.

The screen 305 is touched by a user with two fingers at respective points 310, 312. Thus the capacitance sensing field senses multiple "blips", as two fingers are acting as shunts for a small alternating current that is run to ground (through the user's body). In addition to horizontal and vertical coordinates shown in Figs. 1 and 2 (i.e. X and Y) a "Z" coordinate, which is a height from the surface of the touch screen can also be implemented with the two-finger input previous described.

The distance of each of the fingers from the surface of the touch screen can affect the amount of current that is shunted through the user. There can be a determination made on the distance of the fingers based on the drop of, for example, current relative to a table of values. Of course, if the finger exceeds a distance from the screen that permits the user to act as a shunt, then that particular finger would no longer be sensed as "touching the screen". In fact, the term "touch" is relative in this

NSDOCID: <WO____2005124526A2_I_>

instance, as the fingers can cause actuation of the screen display without necessarily pressing on the screen.

The Z-coordinate can be used, for example to rotate the selected items on the screen around the Z-axis. Additionally, according to the present invention, the Z-coordinate can also be used as a zoom, particularly when the size of the intended selection on the screen is larger than the span of the fingers on the hand. This zoom would be particularly useful in large computer monitors, televisions, bathroom mirrors, etc. The distance of the fingers from the screen can be scaled to provide a variable zoom.

The Z coordinate can then be used to zoom the size of the selection as a function of the distance to the screen. If the angle ά (shown in fig. 3) is kept constant over all distances, the size of the surface of the selection grows with the square of the change in distance from screen. If the user changes the angle ά by moving his fingers closer together or further apart, this would cause what constitutes the selected area, meaning that either more or less than what is between points 310 and 312 shown in Fig. 3 would be selected due to the change in the angle ά.

For example, Fig. 3 first shows a user's fingers in approximate contact with the screen 305. If the user pulled his/her fingers back so as to have them a distance 2h from the screen, then the visible are between the fingers at points 310 and 312 would now be enlarged so as to be displayed between the points 320 and 322. If the fingers are moved somewhat closer to the screen than a distance 2h, but still further away from the screen than points 310, 312, the area of th e screen between points 310 and 312 would be enlarged to cover the space between points 330 and 332. Thus, the user can vary the zoom as needed by moving his/her fingers closer or further from the screen.

It should be noted that "h" shown in Fig. 3 is tak en roughly equal to the distance of the hand to the screen or the length of finger to make the proportional change intuitive. The function of taking the zoom factor of the surface as the square of the distance from the screen can be varied according to need. With regard to zooming, the relationship between the distance "d" (shown in Fig. 3) and the height "h" when there is a change in position can be defined by:

$$d = \frac{(h + \Delta h)}{\Delta h} * d \qquad \text{(wherein } \Delta h > 0\text{).}$$

NSDOCID: <WO____2005124526A2_I_>

For example, if h doubles, then Δh is equal to h and d would be:

$$\frac{(1+1)}{1} * d = 2d.$$

The above relationship holds true so long as the angle ά (alpha, shown in Fig. 3) is constant and $\Delta h > 0$. However, it is possible that for a given alpha that a user cannot span the entire screen and the angle ά must be altered. In such a case, the relationship between d and h can be defined by:

$d = e^{*}((h + \Delta h)/\Delta h) * d$, wherein epsilon (e) is an extra multiplier. For example if epsilon is equal to 2, then a doubling of the distance causes a quadrupling of d (height and wi dth of the area).

It should also be noted that when varying the zoom according to the distance of the fingers from the touch screen, for example, based on an amount of sensed current shunted along a sensing grid, the accuracy of determining the distance of the fingers from the screen is not constant for all distances from the screen. For example, the further away the fingers are from the screen, the less accurate the distance detection tends to become, until eventually it cannot even detect a shunting effect caused by the fingers. To reiterate, the present invention is applicable even if the distance from the screen in which the fingers can be detected changes from what is currently detectable. In addition, although Fig. 3 gives one the impression that the zoom factor is strictly linear, it is understood that in actuality it may not be linear at all. Slight differences in distance closer to the screen may result in a varying in the amount of zoom that is not the same as compared to slight difference in dis tance of the fingers when relatively further away from the screen.

It is also possible that there can also be individual differences in the shunting due to the size of the fingers, for example, a child's finger may not shunt current when approximating cont act with the screen in the exact amount as an adult man with large fingers. However, the individual shunting could result in people with different sized fingers having to position their fingers at a somewhat different distance h to obtain the same degree of zoom as other users. The principle, of course, does not change in that the zoom is varied according to the distance of the finger from the screen.

NSDOCID: <WO_____2005124526A2_I_>

With regard to the variable zoom based on two finger input, the presently claimed invention could also be adapted for use with resistive screens that vary the amount of resistance based on finger pressure. In such a case, touching the screen at two points with a certain degree of pressure could be used to initially select an area for viewing, and then pressing harder into the screen with both fingers (or lighter, for that matter) can be used to variable zoom in and out of the selected area.

Fig. 4 illustrates an example of hardware that can be used according to the present invention. This particular example illustrates a capacitive technology, but it should be noted that it is within the spirit and scope of the presently claimed invention that it can be adapted to other types of touch screens.

A voltage source 401 will provide a predetermined voltage to contacts 405,406,407,408. It is possible that the voltage could be deliver to only some of the contacts and then alternate to other contacts after a predetermined amount of time, or delivered to all the contacts. Typically the screen would have an overlay that is coated with a transparent metal oxide. When the voltage is applied to the contacts, there can be a small current running through the grid 408. When two fingers either touch the screen (represented by the dots 409) or come within a predetermined distance so as to create a voltage drop at the points X1, Y1, X2, Y2, which are represented in the drawing by the dots 409. The finger acts like a shunt to drain some current/voltage from the grid. The exact location of the points are calculated by the controller 415 and transmitted to the display logic 420 that provides the screen output.

The controller 415 has a module 417 that is used to detect an area of the screen, typically a rectangle, whose initial area is determined by the points on the screen contacted. The module 417 contains hardware and/or software to construct a rectangle by finding a midpoint of sense lines activated by the touch at points 409 and provide a perpendicular sense line of the same length through the midpoint

In addition, the module 417 also is adapted to permit 3D –capability, wherein the selected area can be rotated around the Z coordinate, or the proximity of the fingers from the screen at a common angle there between to provide a variable zoom. As the fingers are backed away from the

\SDOCID: <WO_____2005124526A2_I_>

points 409, the zoom becomes larger and the close to the actual points 409 are the two fingers, the zoom can be decreased. It is also possible to reverse the zoom so the zoom becomes smaller as you move your fingers away from the screen and larger as you move closer to the screen.

It should also be understood by persons of ordinary skill in the art that the distance of the fingers from the screen can also be used for functions other than a zoom function. For example, such as distance can be used for increasing/decreasing a selection size of the area that can be controlled.

Various modifications can be made to the present invention by a person of ordinary skill in the art that do not depart from the spirit of the invention or the scope of the appended claims. For example, the touch screen may use resistive, capacitive, SAW, Infrared or NFI (near field imaging). While Applicants disclose that a rectangle is highlighted by two finger touch, it is possible to express other shapes that would still be within the spirit of the invention and the scope of the appended claims. When the rectangle is highlighted, a series of options may appear on the screen, such as move, delete, rotate, that can be activated by touching that particular area of the grid where the words (such as deletion, rotation of 90 degrees, 45 degrees, move, change color, change shape, etc.), can be highlighted. It should be noted that rotation and translation are best done by rotating or moving a hand, rather than just the fingers. In addition, other items, such as changing color and changing shape can be performed by touch.

The screen can be coated with any known film used for touch display, and can be used on any type of display, including mirrors, windows, televisions, winds hields of vehicles (wherein a map could be displayed on a small area thereof, and the fingers could zoom in and out) computers, PDAs, wireless communication devices, standard wireless telephones, video cell phones, etc. Furthermore, while the geographic portion identified by the touch is exemplified in the illustrations as a rectangle or square, it could be a circle, oval, triangle, diamond shape (two opposed triangles) polygonal, parallel-piqued, etc.

CLAIMS:

1. A system for detecting two-finger input on a touch screen, comprising:

a display screen;

a sensing grid arranged for sensing touch on said display screen;

a plurality of electrodes arranged at corners of the sensing grid and being electrically connected to the sensing grid;

a controller that receives an output from the sensing grid; and

a module that identifies at least two points on the grid indicating locations of the display screen that have been touched by a user and identifies a geographic portion of the display screen to be identified based on said at least two points.

2. The system according to claim 1, wherein the at least two points have different X and Y coordinates, and the geographic portion comprises a rectangle.

3. The system according to claim 1, wherein the rectangle comprises t wo active lines in the sensing grid in a horizontal direction and two active lines in a vertical direction.

4. The system according to claim 1, wherein at least one sensed line is connected between said at least two points.

5. The system according to claim 4, wherein a shape of the geographic portion of the display screen to be identified comprises a rectangle.

6. The system according to claim 4, wherein if only one vertical or one horizontal sense line is active on the sensing grid, a size of the rectangle is calculated by the control module sensing a length of said at least one sensed line, and at a midpoint of said at least one sensed line calculating a second line that is perpendicular to said at least one sensed line and having a same length as said at

least one sensed line, and based on a length defined by a location of said at least two points, and a width defined by two end points of the second line, providing coordinates of a rectangle to be identified on the display screen.

The system according to claim 5, wherein the control module provides the coordinates of a rectangle to display logic, that controls an image shown on said display screen.

7. The system according to claim 1, wherein said display screen is adapted for capacitive sensing.

8. The system according to claim 1, wherein said display screen is adapted for resistive sensing.

9. The system according to claim 1, wherein said display screen is adapted for optical sensing.

10. The system according to claim 1, wherein said display screen is adapted for acoustic wave sensing.

11. The system according to claim 1, wherein said display screen is adapted for optical sensing.

12. The system according to claim 1, wherein said display screen is adapted for near field imaging (NFI).

13. The system according to claim 1, wherein the identified geographic portion of said display screen is adapted for selection of an area displayed on the display screen determined by a position of the two finger input sensed by the sensing grid and determined by the controller.

14. The system according to claim 1, wherein the identified geographic portion of said display screen is adapted for at least one of rotation and deletion by a change in a position of the two finger input sensed by the sensing grid and determined by the controller.

15. The system according to claim 1, wherein the identified geographic portion of said display screen is adapted for at least one of highlighting and changing color of items on the display screen by a change in a position of the two finger input sensed by the sensing grid and determined by the controller.

16. The system according to claim 1, wherein the identified geographic portion of said display screen is adapted for moving an item displayed on said display screen by a change in a position of the two finger input sensed by the sensing grid and determined by the controller.

17. The system according to claim 1, wherein the identified geographic portion of said display screen is adapted for variable zooming based on a change in a position of the two finger input sensed by the sensing grid and determined by the controller.

18. The system according to claim 17, wherein the change in position of the two finger input is based on a sensed distance from the screen determined by the controller.

19. The system according to claim 17, wherein a sensed distance is determined by an amount of current drop sensed by the sensing grid and determined by the controller.

\SDOCID: <WO_____2005124526A2_I_>

20. A system for three-dimensional touch sensing but at least two fingers on a touch screen, comprising:

a display screen;

a sensing grid arranged for sensing touch on said display screen;

a plurality of electrodes arranged at edges of the sensing grid and being electrically connected to the sensing grid;

a controller that receives an output of at least two fingers in close proximity to the sensing grid; and

a module that identifies at least two points on the grid indicating locations of the display screen that have been touched by a user and id entifies a geographic portion of the display screen to be identified based on said at least two points to determine an X and a Y coordinate for each point,

wherein said module provides a variable zoom factor based on a Z coordinate comprising a distance of said at least two fingers from the display screen.

21. The system according to claim 20, wherein said module calculates an amount of a drop in current detected at said at least two points to determine a height h of the at least two fingers from the display screen.

22. The system according to claim 21, wherein a view of the identified geographic portion of the display screen is variably magnified as a height h of the two fingers from the screen increases up to a predetermined maximum.

23. The system according to claim 22, wherein the amount of variable magnification is approximately relative to the height h of two fingers from the display screen

24. The system according to claim 20, wherein the identified geographical portion of an image identified on said display screen is adapted for at least one of rotation, selection or deletion

NSDOCID: <WO_____2005124526A2_I_>

according to a change in a position of the two finger input sensed by the sensing grid 410 and determined by the controller.

25. The system according to claim 20, wherein the identified geographical portion of an image on said display screen is adapted to change color according to a change in position of the two finger input sensed by the sensing grid and determined by the controller.

26. The system according to claim 20, wherein the identified geographical portion of an image on said display screen is adapted to change shape according to a change in position of the two finger input sensed by the sensing grid and determined by the controller.

27. The system according to claim 20, wherein the identified geographical portion of an image on said display screen is adapted to change an amount of illumination of the image according to a change in position of the two finger input sensed by the sensing grid and determined by the controller.

28. A method of detecting a two-finger input on a touch screen, comprising:

(a) providing a display screen;

(b) arranging a sensing grid in communication with said display screen for sensing touch on said display screen;

(c) electrically connecting a plurality of electrodes to the sensing grid;

(d) providing a controller that receives an output from the sensing grid; and

(e) identifying at least two points on the grid indicating locations of the display screen that have been touched by a user to select a geographic portion comprising a rectangular portion of the display screen to be identified based on said at least two points touched by at least two fingers.

NSDOCID: <WO____2005124526A2_I_>

29. The method according to claim 28, wherein a size of the geogr aphic portion is calculated by the control module sensing a length of at least one sensed line activated by said at least two points touch by said at least two fingers, and at a midpoint of said at least one sensed line calculating a second line that is perpendicular to said at least one sensed line and having a same length as said at least one sensed line, and based on a length defined by a location of said at least two points, and a width defined by two end points of the second line, providing coordinates of a geographic portion to be identified on the display screen.

30. The method according to claim 28, wherein the geographical portion of an image on said display screen is adapted to change color according to a change in position of the two finger inp ut sensed by the sensing grid and determined by the controller.

31. The system according to claim 28, wherein the geographical portion of an image on said display screen is adapted to change shape according to a change in position of the two finger inpu t sensed by the sensing grid and determined by the controller.

32. The system according to claim 28, wherein the identified geographical portion of an image on said display screen is adapted to change an amount of illumination of the image according to a change in position of the two finger input sensed by the sensing grid and determined by the controller.

33. A method for detecting for three-dimensional touch sensing by at least two fingers on a touch screen, comprising:

(a) providing a display screen;

(b) arranging a sensing grid in communication with said display screen for sensing touch on said display screen;

(c) electrically connecting a plurality of electrodes arranged at corners of the sensing grid;

ISDOCID: <WO_____2005124526A2_I_>

(d) providing a controller that receives an output from the sensing grid; a sensing grid 410 arranged for sensing touch on said display screen;

(e) identifying at least two points on the grid indicating at least two locations of the display screen that have been touched by a user and identifying a g eographic portion of the display screen to be based on a position of said at least two points to determine an X and a Y coordinate for each point; and

(f) providing a variable zoom factor based on a Z coordinate comprising a distance of said at least two fingers from the display screen.

34. The method according to claim 33, wherein a view of the identified geographic portion of the display screen is variably magnified as the height h from the screen increases up to a predetermined maximum.

3NSDOCID: <WO____2005124526A2_I_>

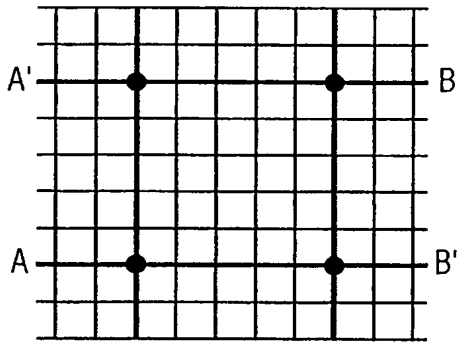


FIG. 1

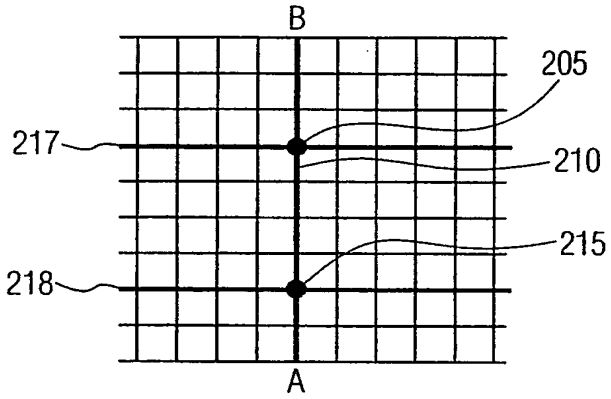


FIG. 2A

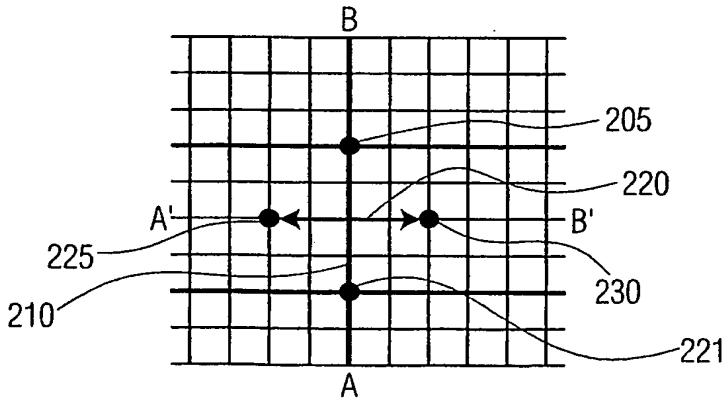


FIG. 2B

NSDOCID: <WO_____2005124526A2_I_>

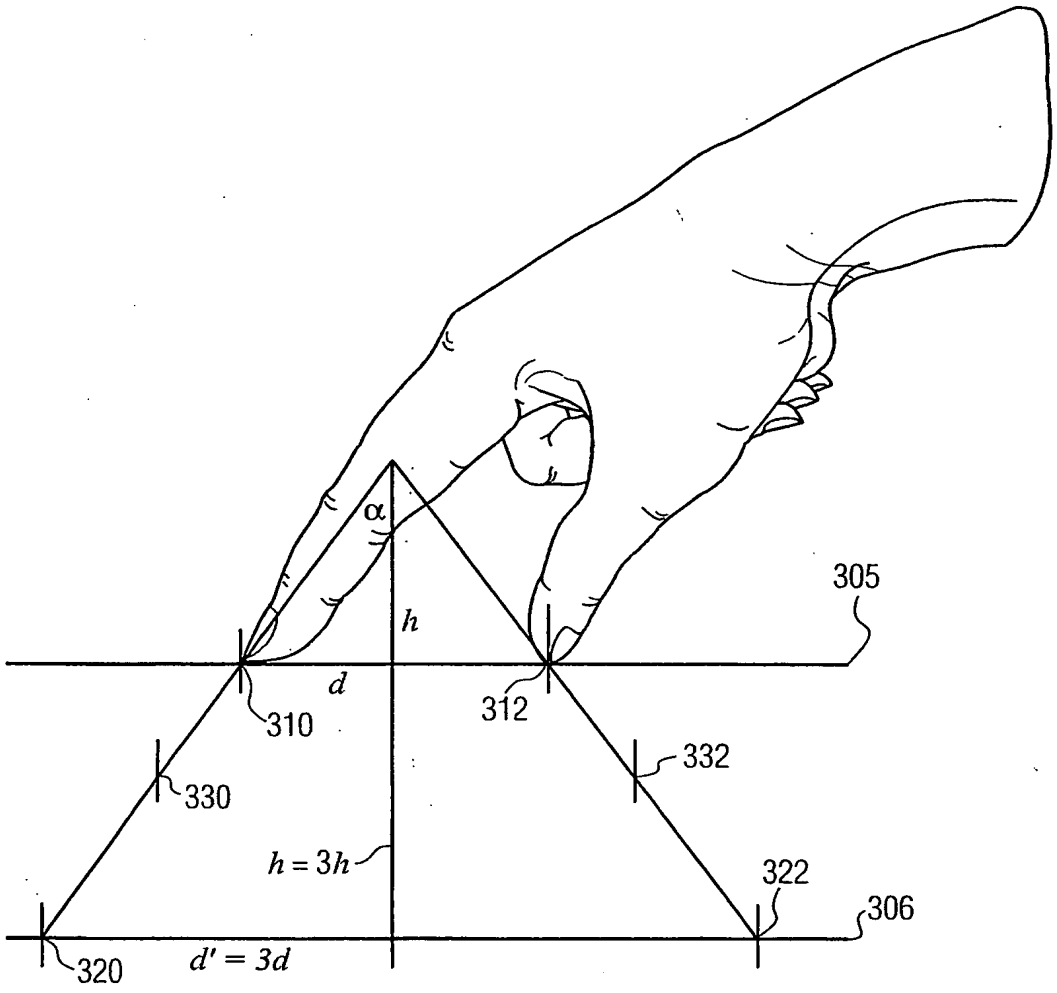


FIG. 3

NSDOCID: <WO_____2005124526A2_I_>

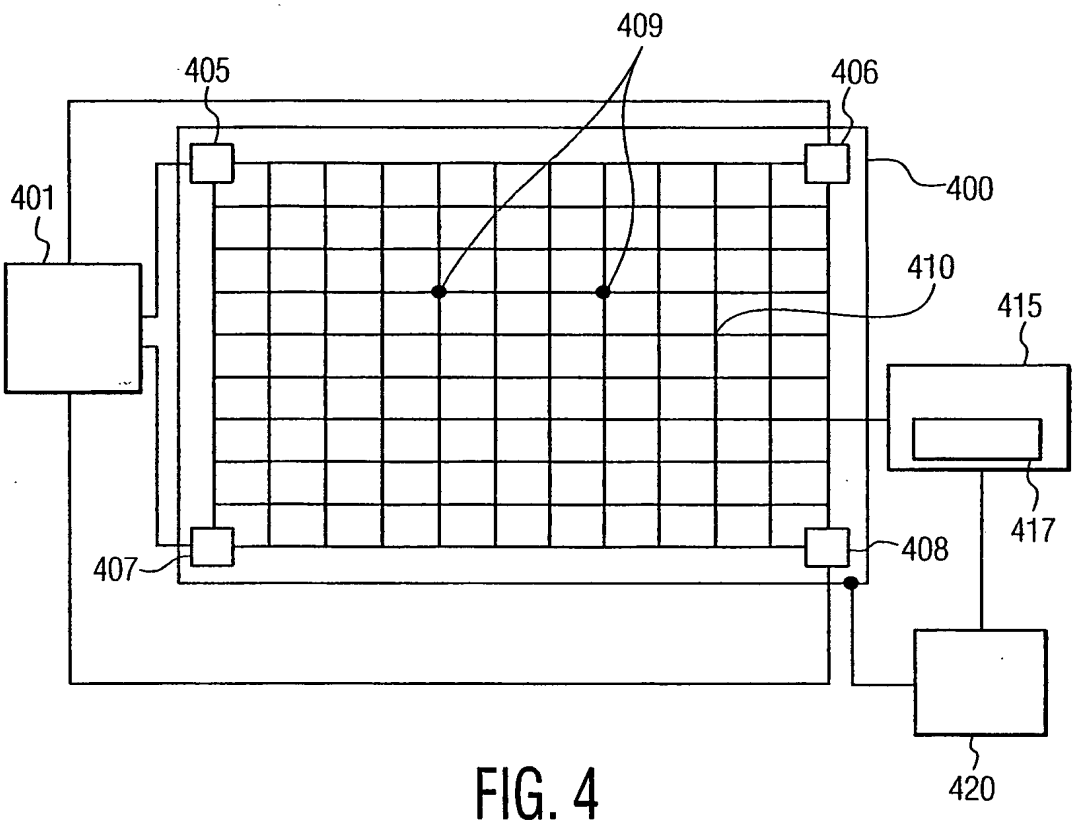


FIG. 4

NSDOCID: <WO 2005124526A2 I >

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

PCT

(43) International Publication Date
29 December 2005 (29.12.2005)

(10) International Publication Number
WO 2005/124526 A3

(51) International Patent Classification:
G06F 3/033 (2006.01)

(21) International Application Number:
PCT/IB2005/052005

(22) International Filing Date: 17 June 2005 (17.06.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/580,655 17 June 2004 (17.06.2004) US

(71) Applicant *(for all designated States except US)*: **KONINKLIJKE PHILIPS ELECTRONICS N.V.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

(71) Applicant *(for AE only)*: **U.S. PHILIPS CORPORATION** [US/US]; 1251 Avenue of the Americas, New York, NY 10020 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **HOLLEMANS, Gerrit G.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL). **KLEINHOUT, Huib V.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL). **HOONHOUT, Heneriette C. M.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL). **WIJDEVEN, Sander B.F. van de** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL). **BUIL, Vincentius P.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

(74) Common Representative: **KONINKLIJKE PHILIPS ELECTRONICS, N.V.**; c/o Edward W. Goodman, P.O. Box 3001, Briarcliff Manor, NY 10510-8001 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

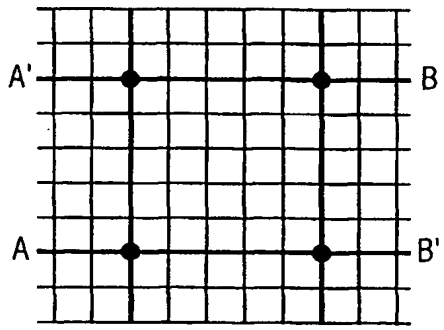
Published:

— *with international search report*

(88) Date of publication of the international search report:
11 May 2006

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: USE OF A TWO FINGER INPUT ON TOUCH SCREENS



(57) Abstract: A system and method for detecting at least two-finger input on a touch screen of a display such as computer, etc. includes a display screen; a sensing grid arranged for sensing touch on said display screen; a plurality of electrodes connected electrically to the sensing grid. A controller receives an output from the sensing grid, and a module identifies at least two points on the grid indicating locations of the display screen that have been touched by a user and identifies a geographic portion of the display screen to be identified based on said at least two points. As the position of the fingers are relative to the position of the screen via change in a direction of a Z -coordinate, a variable zoom can be provided by the sensing grid commensurate with different distances that the multiple fingers are sensed from the display screen.

WO 2005/124526 A3

NSDOCID: <WO_____2005124526A3_I_>

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2005/052005

A. CLASSIFICATION OF SUBJECT MATTER
G06F3/033

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 101 61 924 A1 (SIEMENS AG) 24 April 2003 (2003-04-24) claim 1; figure 1	1-16, 28-32
A	US 5 483 261 A (YASUTAKE ET AL) 9 January 1996 (1996-01-09) claim 1; figures 1,4a-4c,13a-13e	1-16, 28-32
A	EP 0 622 722 A (RANK XEROX LIMITED; XEROX CORPORATION) 2 November 1994 (1994-11-02) claim 1; figures 6a,6b,6e,10b,10c	1-16, 28-32
A	US 6 229 529 B1 (YANO TAKASHI ET AL) 8 May 2001 (2001-05-08) claim 1; figures 8,12	1-16, 28-32

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

*. Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
5 December 2005	16. 02. 2006

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Kirsten, K

2

Form PCT/ISA/210 (second sheet) (April 2005)

ISDOCID: <WO 2005124526A3 I >

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2005/052005

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 773 496 A (INTERNATIONAL BUSINESS MACHINES CORPORATION; INTERNATIONAL BUSINESS MA) 14 May 1997 (1997-05-14) claim 1; figures 1b,5,6	1-16, 28-32
A	US 4 914 624 A (DUNTHORN ET AL) 3 April 1990 (1990-04-03) claim 1; figure 1	1-16, 28-32
A	EP 0 156 593 A (AMP INCORPORATED) 2 October 1985 (1985-10-02) claim 1; figure 1	1-16, 28-32
A	US 2003/020738 A1 (MILBURN ROSS WILLIAM VINTERS ET AL) 30 January 2003 (2003-01-30) claim 1; figures 8b,8c	1-16, 28-32
A	EP 0 689 122 A (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD) 27 December 1995 (1995-12-27) claim 1; figures 77,81	1-16, 28-32

2

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

NSDOCID: <WO____2005124526A3_I_>

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2005/052005

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1(PART), 2-16, 28-32

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

NSDOCID: <WO 2005124526A3 I >

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1(part), 2-16,28-32

Detecting two finger input on a touch screen and identifying an area on the screen.

---

2. claims: 1(part),17-27,33-34

Detecting two finger input on a touch screen and sensing the distance from the screen.

ISDOCID: <WO_____2005124526A3_I_>

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2005/052005

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 10161924 A1	24-04-2003	NONE	
US 5483261 A	09-01-1996	JP 5298016 A	12-11-1993
EP 0622722 A	02-11-1994	DE 69430967 D1	22-08-2002
		DE 69430967 T2	07-11-2002
		JP 3383065 B2	04-03-2003
		JP 7168949 A	04-07-1995
		US 5511148 A	23-04-1996
US 6229529 B1	08-05-2001	NONE	
EP 0773496 A	14-05-1997	DE 69613656 D1	09-08-2001
		DE 69613656 T2	29-05-2002
		JP 9146708 A	06-06-1997
		US 5943043 A	24-08-1999
US 4914624 A	03-04-1990	NONE	
EP 0156593 A	02-10-1985	JP 60211529 A	23-10-1985
		KR 9202755 B1	02-04-1992
		MX 160425 A	22-02-1990
US 2003020738 A1	30-01-2003	CN 1400550 A	05-03-2003
EP 0689122 A	27-12-1995	CN 1123059 A	22-05-1996
		WO 9520187 A1	27-07-1995

NSDOCID: <WO 2005124526A3 I >